

ANNEX SEVEN
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
STENNIS SPACE CENTER
AND
BLUE ORIGIN, LLC
UNDER SPACE ACT UMBRELLA AGREEMENT
NO. SSAA-1053-0154

ARTICLE 1. PURPOSE

This Annex shall be to perform a test facility modification Preliminary Design Review in support of Blue Origin's (Partner) BE4 propulsion hardware development. This effort supports government and the commercialization of space activities.

The legal authority for this Annex, consistent with the Umbrella Agreement, is in accordance with the Space Act, Other Transactions Authority (OTA), 51 U.S.C. § 20113(e).

ARTICLE 2. RESPONSIBILITIES

A. NASA SSC will use reasonable efforts to:

1. Utilize SSC NASA civil service and support contractor staff to provide propulsion test engineering in support of Blue Origin's propulsion system development of the BE4 component. The primary activity will be the engineering of the SSC E1 test complex modifications through the development of a Preliminary Design Review. Information exchange between the parties will be by the Points of Contact (POCs) as identified within Article 8.

2. Perform propulsion test engineering development of concepts and Preliminary Design Review. This effort will be executed in a partner joint-effort type approach with both parties contributing to the requirements, design, and modeling efforts.

3. The specific products produced by SSC will be concepts and Preliminary Design Review of the following:

- Mechanical Design:
 - PSKs (P&IDS) Drawings
 - Major facility piping and instrumentation systems interfacing with the test article, such as the main propellant supplies and pressurization systems
 - Test Article (Igniter System, World Purge, Hi-Freq Pressure Transducer Purge, etc.)
 - Creo Model
 - HP LOX Run-line Piping
 - HP LNG Run-line Piping
 - LOX and LNG Venturi

- Analysis:

- Thrust Take Out Structure (TTOS) Analysis confirming that the existing TTOS can handle the thrust load of the test hardware.
- LOX and LNG Fluid System Modeling showing that the facility can meet test hardware requirements.
- Pipe flexibility analysis documenting that the propellant run-line routing does not result in any overstressing of the pipe and provide resulting test article interface loads.
- Identify clear facility and test article interface configuration requirements and documentation with allowable interface loads at specified connection points.
- Preliminary Flow Protuberance Analysis for temperature sensors in the LOX and LNG Run-lines. Goal would be to identify if we have RTD/TCs on the shelf that will work or if additional items will need to be procured.

- Miscellaneous:

- Component Identification.
- Long Lead Identification.
- Critical spares management plan.

- Assessment of Cost and schedule estimate per the Preliminary Design:

- Itemized assessment of cost and schedule by subsystem (LOX, LNG, ignition system, etc.)
- Forecasted Test Cadence/Capabilities.
- Forecasted per test cost and cost structure (and any maintenance fees).

4. Develop, lead, and produce the Preliminary Design Review out brief.

5. Provide for a single POC for this agreement Annex Seven.

6. Provide monthly cost reporting to partner.

B. Partner will use reasonable efforts to:

1. Provide single point of contact for project leadership and communication for all requests associated with this Annex Seven.

2. Coordinate with NASA and provide timely funding to SSC to support the execution of this Annex Seven.

3. Provide requirements and expectations at the initial conceptual design team meetings.

4. Participate in weekly working sessions for the development of the Preliminary Design Review.

5. Support a facility/test article systems level hazard analysis providing test article expertise in failure modes, effects, and analysis.

6. Support a Preliminary Design Review with documentation on the test article status and outstanding open items.

7. Provide single POC for daily project activities, coordination, and overall task management, reviews, and approvals.

ARTICLE 3. SCHEDULE AND MILESTONES

The planned major milestones for the activities for this Annex defined in the "Responsibilities" Article are as follows:

Formal Authorization to Proceed (ATP)	Upon execution of agreement
Initial concept discussion	08/29/2022
Preliminary Design Review (PDR) completed by	11/30/2022

ARTICLE 4. FINANCIAL OBLIGATIONS

A. Partner agrees to reimburse NASA an estimated cost of \$239,940 for NASA to carry out its responsibilities under this Annex.

Payment shall be marked with "Annex Seven, SSAA-1053-0200" and received before Initial Concept Discussion begins.

B. NASA will not provide services or incur costs beyond the current funding. Although NASA has made a good faith effort to accurately estimate its costs, it is understood that NASA provides no assurance that the proposed effort under this Annex will be accomplished for the estimated amount. Should the effort cost more than the estimate, Partner will be advised by NASA as soon as possible. Partner shall pay all costs incurred and have the option of canceling the remaining effort or providing additional funding in order to continue the proposed effort under the revised estimate. Should this Annex be terminated, or the effort completed at a cost less than the agreed-to estimated cost, NASA shall account for any unspent funds within 180 days after completion of all effort under this Annex, and promptly thereafter, at Partner's option return any unspent funds to Partner or apply any such unspent funds to other activities under the Umbrella Agreement. Return of unspent funds will be processed via Electronic Funds Transfer (EFT) in accordance with 31 C.F.R. Part 208 and, upon request by NASA, Partner agrees to complete the Automated Clearing House (ACH) Vendor/Miscellaneous Payment Enrollment Form (SF 3881).

ARTICLE 5. INTELLECTUAL PROPERTY RIGHTS - DATA RIGHTS

A. Data produced under this Annex which is subject to paragraph C. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement will be protected for the period of two years.

B. Under paragraph H. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement, Disclosing Party provides the following Data to Receiving Party. The lists below

may not be comprehensive, are subject to change, and do not supersede any restrictive notice on the Data provided.

1. Background Data: The Disclosing Party's Background Data, if any, will be identified in a separate technical document.
2. Third Party Proprietary Data: The Disclosing Party's Third Party Proprietary Data, if any, will be identified in a separate technical document.
3. Controlled Government Data: The Disclosing Party's Controlled Government Data, if any, will be identified in a separate technical document.
4. The following software and related Data will be provided to Partner under a separate Software Usage Agreement: None

ARTICLE 6. TERM OF ANNEX

This Annex becomes effective upon the date of the last signature below and shall remain in effect until the completion of all obligations of both Parties hereto, or one (1) year from the Effective Date, whichever comes first, unless such term exceeds the duration of the Umbrella Agreement. The term of this Annex shall not exceed the term of the Umbrella Agreement. The Annex automatically expires upon the expiration of the Umbrella Agreement.

ARTICLE 7. RIGHT TO TERMINATE

Either Party may unilaterally terminate this Annex by providing thirty (30) calendar days written notice to the other Party.

ARTICLE 8. MANAGEMENT POINTS OF CONTACT

The following personnel are designated as the Management Points of Contact between the Parties in the performance of this Annex.

NASA Stennis Space Center

Gary O. Taylor
New Business Development Manager
Building 1100
Stennis Space Center, MS 39529
Phone: (228) 332-2362
Email: gary.o.taylor@nasa.gov

Blue Origin

Charles Watson
Combustion Device Program Manager
21218 76th Avenue S
Kent, WA 98032-2442
Phone: (952) 451-8640
Email: cwatson@blueorigin.com

ARTICLE 9. MODIFICATIONS

Any modification to this Annex shall be executed, in writing, and signed by an authorized representative of NASA and the Partner. Modification of an Annex does not modify the terms of the Umbrella Agreement.

ARTICLE 10. SIGNATORY AUTHORITY

The signatories to this Annex covenant and warrant that they have authority to execute this Annex. By signing below, the undersigned agrees to the above terms and conditions.

National Aeronautics and Space
Administration
John C. Stennis Space Center

JOSEPH
BY: **SCHUYLER**
Joseph R. Schuyler
Director
Engineering and Test Directorate

Digitally signed by
JOSEPH SCHUYLER
Date: 2022.09.06
16:07:08 -05'00'

Blue Origin, Inc.

DocuSigned by:
Donna Elburn
BY: _____
467BC07DEAD6460...
Donna Elburn Blue Origin
ISC Director

DATE: _____

DATE: 9/9/2022 | 1:55 PM PDT
